A New *Dictya* in California, with Biological Notes

(Diptera : Sciomyzidae)

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For reasons of consistency, *Dictya fontinalis*, new species, is described in close accordance with the format used by G. C. Steyskal (1954). In his key, *D. fontinalis* runs to *D. montana* Steyskal in the "Typical Group." In this sense, *D. montana* (in California) has been split so that now we recognize three species of *Dictya* in California. The third species, *D. texensis* Curran, occurs with *D. montana* in the southern part of the state.

Dictya fontinalis Fisher and Orth, new species

HOLOTYPE MALE.—Wing length 5.3 mm. Prosternum bare. Background color of body rosy-pink, especially apparent in fresh specimens, and usually persisting on postscutellum of pinned material. Postabdomen as in fig. 1. Surstylus with dorsal tip well projecting, not sharply angulate, but blunted or somewhat rounded, lateral line not strongly S-shaped. Ventral process of hypandrium without preterminal lobe, apex with anteriorly directed tip, subapical portion flattened with anterior margin turned outward as viewed ventrally. Ventral processes of hypandrium parallel in anterior view (fig. 2), quite narrow in lateral view, appearing much broader when flattened or viewed at an angle so that the maximum width can be perceived (fig. 3A). Ventral process of epandrium with small, short posterior lobe.

For comparison, fig. 3B illustrates the flattened ventral process of the hypandrium of *D. montana.*

ALLOTYPE FEMALE.—Wing length 6.3 mm. Prosternum bare. Color as in male. Postabdominal sternites as in fig. 4A. Sternite VI rectangular, nearly twice as broad as long, anterior corners almost right-angled, posterior corners slightly rounded. Sternite VII deeply bimarginate anteriorly, anterior margin of median lobe nearly straight. Posterior margin of sternite VIII shallowly concave without distinct lobes; apodemes (fig. 4B) subrectangular, apparent thin indistinct connecting structure an illusion created in part by infolding and adnation of the

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FIG. 1. *Dictya fontinalis* Fisher and Orth, Holotype: Postabdomen, dextral view, inverted; ep, epandrium; hy, hypandrium; ss, surstylus. Fig. 2. *Dictya fontinalis,* Holotype: Anterior view of hypandrium inverted. FIG. 3. Terminal portion of ventral process of hypandrium, flattened: A. *Dictya fontinalis*, Paratopotype, 3 August 1965 (T. W. Fisher and R. E. Orth); B. *Dictya montana* Steyskal, U. S. A., California, Los Angeles Co., Gorman, 3,800 ft., AS-596 (R. E. Orth). FIG. 4. *Dictya fontinalis*, Allotype: A. Sternites VI–X; B. Internal view of sternites VII and VIII to show apodemes.

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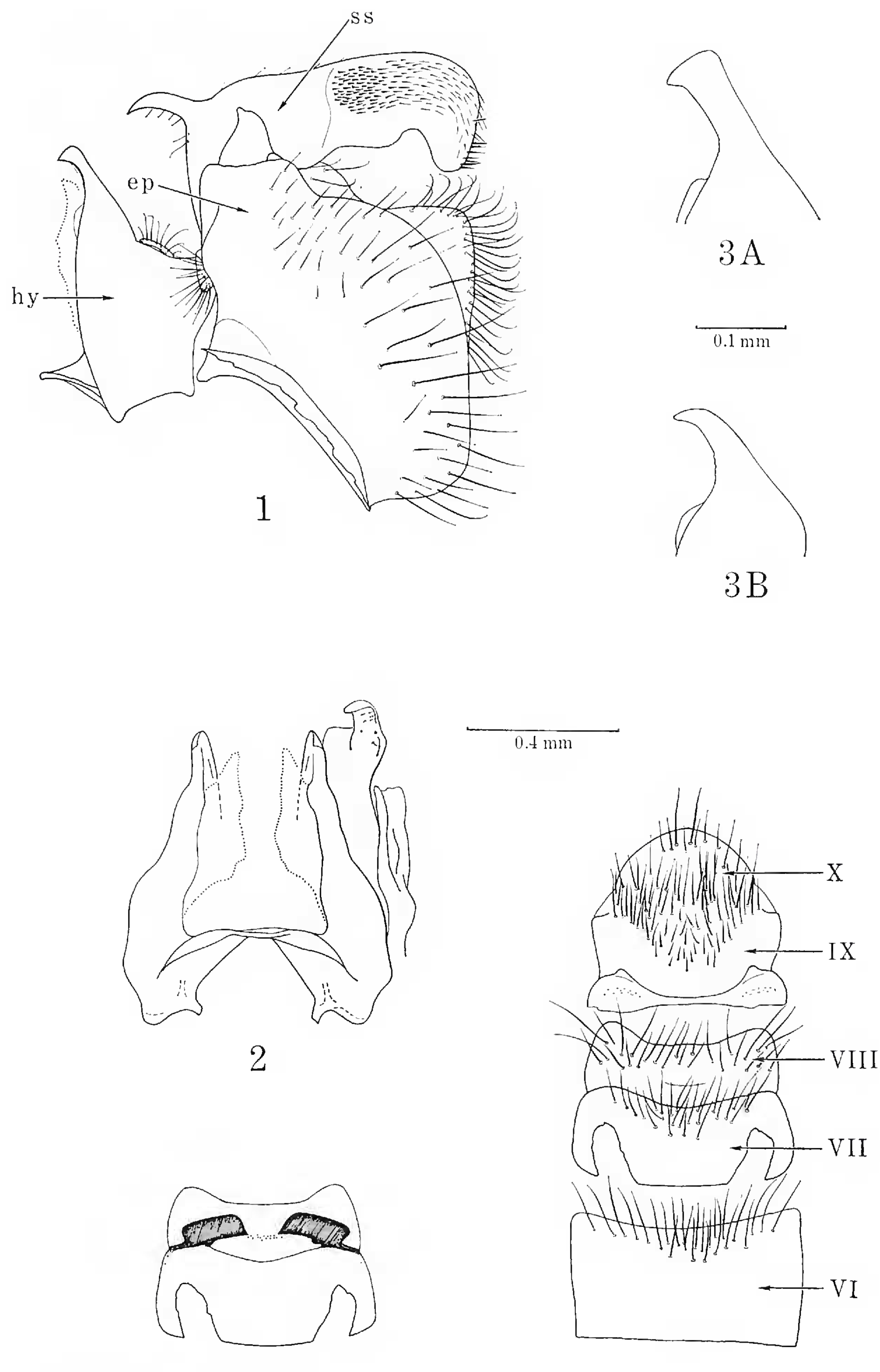
ss
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1
3A
0.1 mm
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margins of sternites VII and VIII. Lateral lobes on anterior margin of sternite IX each with small sublateral tooth directed posterad but slightly elevated from sternite, and from posteroventral view connected by weakly developed narrow shelf.

Holotype Male, BOCA SPRING, NEVADA COUNTY, CALIFORNIA, 5,900 ft. elevation, approximately 39° 26′ North latitude, 120° 04′ West longitude and shown as Boca Spring on U.S.G.S. Boca Quadrangle 7.5 minute series map, 1955, the actual site being near SW corner of NW ¼ NE ¼ Section 10, T 18 N, R 17 E, Mt. Diablo BM, 7 June 1966, Field Accession No. AS-443 (T. W. Fisher and R. E. Orth).

ALLOTYPE.—Shasta Co., Cassel, 5 July 1955 (J. W. MacSwain); approximately 40°54′ North, 121°33′ West. PARATOPOTYPES.—81 ♂ (average wing length, 5.2 mm), 18 ♀ (average wing length, 6.2 mm); 3 August 1965 (AS-350), 7 June 1966 (AS-443), 22 September 1966 (AS-539) (T. W. Fisher and R. E. Orth). See Fig. 5. OTHER PARATYPES.—Mendocino Co., 1 ♂, 14 mi. W. Willits, 30 June 1951 (W. C. Bentinck), approximately 39°25′ North, 123°21′ West. 2♀, Nevada Co., Nevada City, Goldflat Road, 2,500 ft. elevation, 13 June 1965 (AS-320) (T. W. Fisher), approximately 39°16′ North, 121°00′ West. 1 ♂, ½ mi. S.W. Boca Spring, 5,750 ft., 22 September 1966 (AS-540) (T. W. Fisher and R. E. Orth).

OTHER MATERIAL SEEN.—1 ♂, 1 ♀ (in alcohol), Trinity Co., Waldorff Ranch (near Big Bar), 3 July 1964, 2,400 ft. (J. C. Borden), approximately 40.44 North, 122.57 West.

DEPOSITION OF TYPE MATERIAL.—Holotype, allotype, to California Academy of Sciences, CAS Type No. 10207; plus twelve paratopotypes. Fourteen paratopotypes to U. S. National Museum. Twelve paratopotypes to Cornell University. Sixty-two paratopotypes and 4 paratypes in Museum of Department of Entomology, University of California, Riverside.

DISTRIBUTION.—Although we have collected extensively throughout California for six years, *D. fontinalis* has been found only in latitudes 39° and 40° North in mountainous terrain.

The Trinity County specimens and all but one of the specimens that we collected were taken at flowing cold springs. Thus, the specific name *fontinalis* (Latin—of or from a spring).

DISCUSSION

We have collected approximately 3,000 specimens of *Dictya* throughout California which we now place in *D. montana*, but a number of localized forms can be recognized on the basis of gross coloration, size, and by differences in certain structures of the male postabdomen. How-

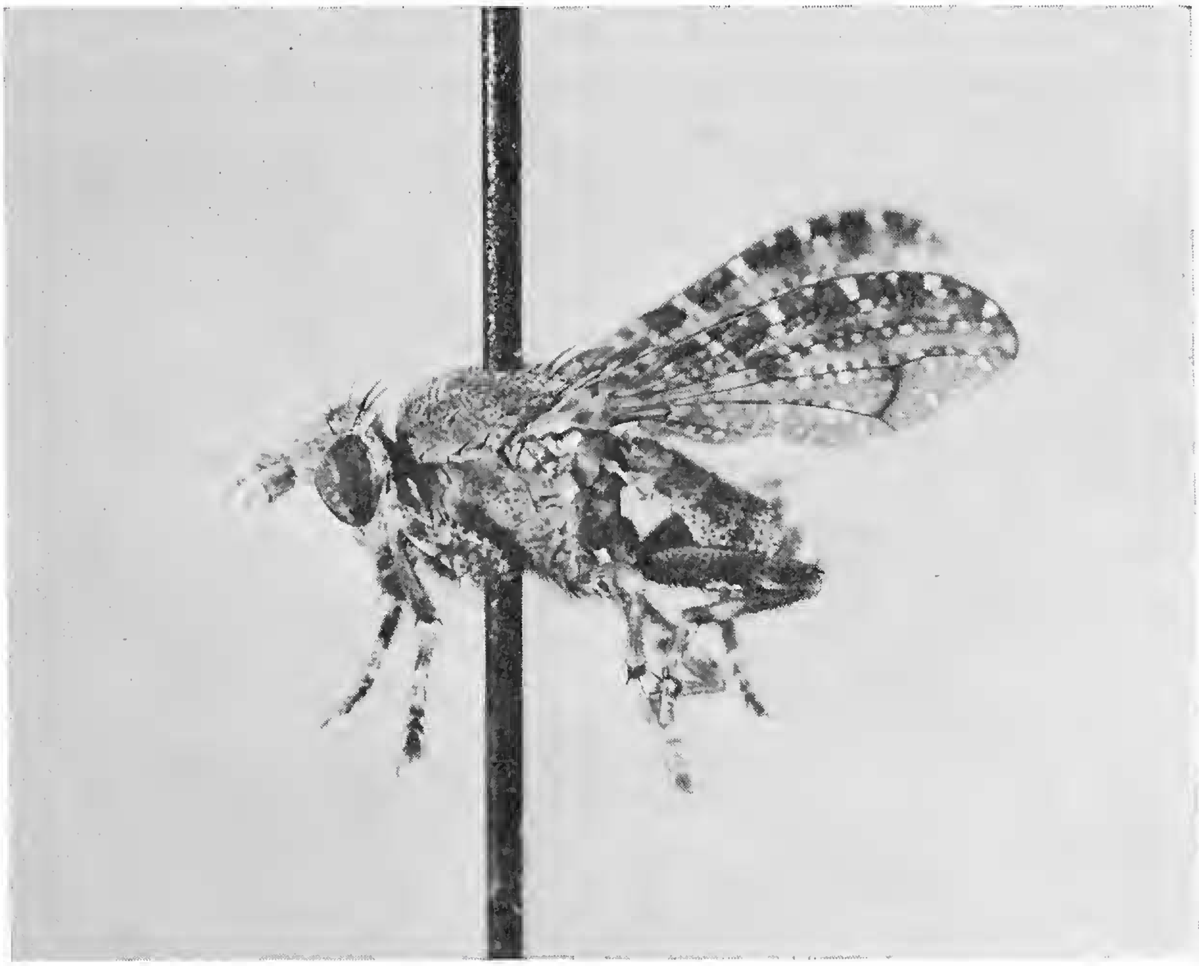

FIG. 5. *Dictya fontinalis* Fisher and Orth, Paratopotype, male.

ever, at present we consider *D. montana* to be a polytypic species. This concept was reinforced by reciprocal crossmating tests, which showed various degrees of crossing-compatability, between individuals and/or small groups of individuals from four populations of *montana* from widely separated localities in the state.

Attempts at crossmating *D. fontinalis* with two forms of *D. montana* were unsuccessful. In fact copulation was never observed during these tests, and no eggs were deposited by females of either species. Interestingly, *montana-texensis* crossmating tests did result in attempted copulation both ways, and numerous non-fertile eggs were laid by *D. montana* females mated by *D. texensis* males. No eggs resulted from the reciprocal cross. No attempts were made to cross *D. texensis* and *D. fontinalis*.

Field evidence that *D. fontinalis* is reproductively isolated from *D. montana* is afforded in the general Boca Spring area where *D. fontinalis* is the most abundant sciomyzid fly at the type locality, a marshy meadow adjoining the spring proper. A half mile away at a flowing stream-marshy meadow habitat at a slightly lower elevation, *D. montana* is the dominant species of *Dictya*. From a total of four collections at

TABLE 1. Comparison of total numbers of sciomyzid flies collected at two nearly contiguous sites in Nevada County, California.

	Boca Spring (4 collections)	Stream site (3 collections)
Antichaeta testacea Melander	0	4
Atrichomelina pubera (Loew)	1	0
Dictya fontinalis F & O, n. sp.	100	1
Dictya montana Steyskal	3	15
Limnia severa Cresson	24	5
Pherbellia humilis (Loew)	1	0
Pherbellia nana (Fallén)	2	3
Pherbellia obscura Ringdahl	0	1
Pherbellia schoenherri (Fallén)	21	29
Sepedon borealis Steyskal	18	1
Sepedon capellei Fisher & Orth	1	4
Tetanocera nanciae Brimley	21	7
Tetanocera soror Melander	2	0

the spring and three collections at the stream totals of *D. fontinalis* and *D. montana* were 100:3 at the spring and 1:15 at the stream.

The type locality, Boca Spring, consists of a broad gently sloping marshy meadow of low grasses and *Eleocharis*, and is bordered by pines. Water comes to the surface at the easterly edge of the meadow and flows in a number of cold, narrow, shallow, clear streamlets in a westerly direction toward the Little Truckee River, a half-mile distant. In the past, some of the water was diverted into a small catchment built of concrete and rocks, now partly in ruins, which early settlers named "Boca Spring" after the railroad station "Boca" (Spanish—mouth) located near the mouth of Little Truckee River where it enters the Truckee River. The damming of Little Truckee River created Boca Reservoir. The catchment at Boca Spring is choked with water cress and this plant and water celery grow profusely along the water courses in the adjacent meadow. By far the most numerous mollusk is a tiny aquatic prosobranch snail, *Lithoglyphus turbiniformis* (Tryon) (Family: Hydrobiidae) which clings to the submerged leaves and stems of cress and celery as well as rocks both in the catchment and in the meadow. A fingernail clam is a common benthic mollusk particularly in the catchment. Intensive searching in the area revealed a few slugs, an individual succineid snail, and a few small lymnaeid snails.

The lower stream habitat where *Dictya* is predominantly represented by *D. montana* is a somewhat drier meadow in a wide gulley choked with grasses and sedges 24 or more inches in length. Scattered pines provide sparse shade. The stream flowing through it originates at a nearby spring area in a water course independent from Boca Spring and forms small (3′ × 3′) basins as it flows westerly toward Boca Reservoir, and it appears to be subject to silting from seasonal runoff in the gulley that continues for perhaps 1½ miles above the collecting site. The course of the stream in the meadow is shaded by tall grasses which nearly conceal it. In August, water temperature at the stream site (as well as Boca Spring) was 54° F at 11 A.M. The dominant snail in this waterway is *Physa gyrina* Say. We have never found hydrobiid snails at this site. Competition for *Physa* with other sciomyzid flies, *Pherbellia schoenherri* (Fallén) in particular, probably is reflected in lower total numbers of *D. montana* taken. Total numbers of all species of Sciomyzidae taken at both sites are shown in Table 1. Collecting was performed with the D-Vac suction collector and conventional aerial-sweep nets. The collecting dates over a three-year period fell between 7 June and 22 September. The lower (stream) site affords a more typical habitat, as indicated by its dominant mollusk, the ubiquitous *Physa*, with which many sciomyzid flies are associated in California.

Operculate snails are unsuited as host species for most Sciomyzidae because feeding larvae become pinched as the operculum is pulled into the aperture of the snail. However, Neff and Berg (1962) concluded that *Littorina littorea* (L.), a shoreline species having a coriaceous operculum, is the normal prey of *Hoplodictya setosa* (Coquillett). Also, Knutson and Berg (1967) state that third-instar larvae of *Knutsonia tritaria* (Loew), a European species, eat portions of the soft parts of certain operculate snails (*Hydrobia* sp. and *Melanopsis algerica* (Pilsbry), a spring-pool inhabitant in southern Spain).

In the laboratory, larvae of *Dictya fontinalis* rarely could be reared through the second instar solely on a diet of very small juvenile *Physa virgata* Gould (the species available at Riverside, Calif.) and the individual which was reared through all larval stadia on *P. virgata* died as a pupa. Development was completed, however, on a diet solely of *Fontelicella californiensis* Gregg and Taylor (Hydrobiidae) obtained from a spring area along San Felipe Creek in northeastern San Diego County, California. During earlier tests, two other species of Hydrobiidae, *Lithoglyphus turbiniformis* (Tryon, 1865) from Boca Spring and *Tryonia* sp. from a spring along the Westgard Pass road east of Bigpine, Inyo County, California, were eaten by these larvae. Newly hatched first-instar larvae of *D. fontinalis* were able to attack and feed on the mature hydrobiid snails mentioned [Maximum-sized *Fontelicella* = 1.2 mm (aperture) × 2.9 mm (length), *Lithoglyphus* = 1.4 ×

2.5, *Tryonia* = 1.1 × 3.3]. Although we were unable to provide a complete range in sizes of those snails, it seems reasonable to assume that newly emerged hydrobiid juveniles, not only being smaller, but having a less rigid operculum, would be more vulnerable to attack by newly hatched first-instar larvae of *D. fontinalis*. Following first-instar development on hydrobiid snails, late second- and third-instar larvae readily attacked small to half-grown *Physa*, *Lymnaea*, and *Planorbella*, as well as hydrobiids.

ACKNOWLEDGMENTS

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